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(दूसरा पुनरीक्षण)

Laying and Finishing of Cement Concrete Tiles — Code of Practice

(Second Revision)

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भारतीय मानक ब्यूरो
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Flooring, Wall Finishing and Roofing Sectional Committee, CED 5

FOREWORD

This Indian Standard (Second Revision) was adopted by the Bureau of Indian Standards, after the draft finalized by the Flooring, Wall Finishing and Roofing Sectional Committee had been approved by the Civil Engineering Division Council.

This standard was first published in 1959 and subsequently revised in 1972. This revision incorporates the experience gained with the use of this standard and brings the standard in line with the latest developments in this field.

In this revision, the following major changes have been incorporated:

a) Title of the standard has been modified from ‘Code of practice for laying and finishing of cement concrete flooring tiles’ to ‘Laying and finishing of cement concrete tiles — Code of practice’ as the standard covers laying of both floor and wall tiles;
b) Preparation and use of cement mortar and lime mortar for bedding concrete tiles have been separately described;
c) Permissible tolerances in laying of tiles have been specified; and
d) Synthetic grinding wheel to be used for grinding and polishing has been specified and detailed.

The composition of the Committee responsible for formulation of the standard is given in Annex B.

For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test or analysis shall be rounded off in accordance with IS 2 : 1960 ‘Rules for rounding off numerical values (*revised*)’. The number of significant places retained in the rounded off value shall be the same as that of the specified value in this standard.

Indian Standard

LAYING AND FINISHING OF CEMENT CONCRETE TILES — CODE OF PRACTICE

(Second Revision)

1 SCOPE

This standard covers the laying, finishing and maintenance of cement concrete tiles in floors, walls, staircases, pavings, etc.

2 REFERENCES

The standards listed in Annex A contain provisions which through reference in this text, constitute provisions of this standard. At the time of publication, the editions indicated were valid. All standards are subject to revision and parties to agreements based on this standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated in Annex A.

3 TERMINOLOGY

For the purpose of this standard, the following definitions shall apply.

3.1 General Terms

3.1.1 *Base* — The prepared surface on which the flooring is laid.

3.1.2 *Efflorescence* — Patches of whitish scum formed by the deposition of soluble salts which appear on the flooring particularly noticeable on plain tiles.

3.1.3 *Grout or Slurry* — Neat cement mixed with water to honey-like, if used for grouting joints of tiled consistency; it may include pigments floor. Sand, stone dust or any other aggregate shall not be added.

3.1.4 *Matrix* — The binding constituent of the top layer of the tile which is chiefly Portland cement, either plain or mixed, with pigments.

3.1.5 *Pin Holes* — These are tiny air-cells in terrazzo tiles which open up during the polishing process and are too small to be filled.

3.1.6 *Pores* — Holes appearing in the surface of the hardened terrazzo tile after the initial grinding.

3.1.7 *Sub-floor* — The structural floor upon which the base is formed.

3.1.8 *Tiles* — The term ‘tile’ used in this standard shall apply to the following cement concrete tiles:

a) Plain tiles;
b) Plain coloured tiles;
c) Terrazzo tiles;
d) Chequered, embossed or specially manufactured non-slip tiles; and
e) Precast staircase treads, risers, wall tiles, etc.

3.2 Tools and Accessories

3.2.1 *Screed* — Narrow strips of wood, bands of plaster or pieces of tiles laid on the floor to act as guides for bringing the whole of the work to a true and even surface. The screeds shall be removed after laying all the true and even surface. floor area for which they have been applied as guides.

3.2.2 *Screeding Board* — A straight-edged wooden plank used for floating a plane surface. It is moved with a sawing action, the two ends resting on screeds or guides set at the correct height.

3.3 Site Operation

3.3.1 *Bedding* — A layer of mortar applied to the base or sub-floor and brought to a defined level.

3.3.2 *Damp-Proofing* — Covering the sub-floor with a continuous layer of impervious material so as to prevent penetration of moisture.

3.3.3 *Filling* — A plain or coloured cement paste with which the open pores of terrazzo tiles are filled or plastered after grinding. The term also refers to the operation of filling.

3.3.4 *Grinding* — The process by which the aggregate of tiles is exposed by means of mechanical or manual grinding.

3.3.5 *Polishing* — Rubbing of tiles mechanically or by hand with polishing stones after they have been laid, and bringing out their sheen.

3.3.6 *Screeding* — Bringing the floor to a true and even surface by means of screeding boards and screeds.

4 MATERIALS

4.1 Sand

The sand to be used for mortar for laying the tiles shall conform to IS 2116 and the sand shall have minimum fineness modulus 1.5.

4.2 Cement

Cement used for the floor work shall conform to IS 269 or IS 455 or IS 1489 (Part 1) or IS 1489 (Part 2) or IS 16415.

4.3 Lime

Lime used shall be Class B or Class C conforming to IS 712.

4.4 Tiles

The cement concrete flooring tiles to be used shall conform to IS 1237.

4.5 Shiner and Sealer

Shiner and sealer can be used in the polishing of tiles shall be such as to give a satisfactory performance without detrimental effects.

4.6 Pigments

4.6.1 Synthetic or natural pigments may be used in mortar or for grouting to obtain desired shades of colours. The pigment used should result in durable colours of tile. It shall not contain matters detrimental to concrete. Pigments, either singly or in combination, conforming to IS 1237 may be used. Pigment quantity to be restricted to a maximum of 9 percent by weight of cement content. The fineness of pigment should be more than the fineness of cement.

4.7 Water

Water used shall be clean and free from oil, acid, alkali, organic or vegetable matter. Sea water shall not be used.

5 COMPLETION OF WORK PRECEDING THE LAYING OF TILES

5.1 All the inside walls, ceiling and outside walls shall be plastered and door frames and windows fixed in position.

5.2 The sub-floor shall be finished to a reasonably true plane surface about 35 to 50 mm below the level of the finished floor, properly graded and free from loose earth, dirt or dust and lumps.

5.3 Before tiling work is started, all points of level for the finished tile surface shall be marked out. This is particularly necessary in the case of finished staircase landings. Wherever slopes in finished floors are desired points of level and outlets shall be correctly marked and outlet openings made beforehand.

5.4 Protection Against Dampness

Wherever it is feared or suspected that dampness may percolate on to the top of the sub-floor or base during any time of the year, the same shall be treated or covered with any of the recognized damp-proofing methods to prevent dampness or water rising to the top of the sub-floor or base. Where it is suspected that water may percolate from the side walls, the same shall also be properly waterproofed up to at least 15 cm above the level of the sub-floor.

6 BEDDING

6.1 Preparation of Mortar

Both cement mortar as well as lime mortar can be used for preparation of bed for laying of tiles. The method of preparation and laying of each type of mortar shall be as given in **6.1.1** to **6.1.4**.

6.1.1 *Cement Mortar*

Cement mortar shall consist of one part of Portland cement and five parts of coarse sand by volume thoroughly mixed. The minimum quantity of water necessary to give sufficient plasticity and workability for laying shall be added and mixed manually or by using a mechanical mixer. A high water-cement ratio will give a screeded bed with drying and shrinkage cracks, hence a high water-cement ratio should be avoided.

6.1.2 *Spreading of Cement Mortar*

Before spreading of cement mortar, it is essential to ensure that the base is well compacted and the surface is rough to form suitable key. The base shall then be cleaned of all scum, laitance or plaster droppings or any other loose foreign matter. It shall be properly wetted without allowing any water pools on the surface. The mortar shall then be evenly spread over the base for two rows of tiles and up to 3 m in length with thread level fixed at both ends to act as a guide to avoid the optical illusion of depression. The top of mortar shall be kept rough so that cement slurry can be absorbed. The thickness of the bedding shall normally be not less than 10 mm and not more than 30 mm in any one place. Immediately after, the laying of tiles shall start as described in **6.2**.

6.1.3 *Lime Mortar*

Lime mortar may be prepared in any of the following proportions:

a) 1 lime,1 *Surkhi*, 2 Coarse sand; or
b) 1 lime, 3 *Surkhi*; or
c) 1 lime, 3 Coarse sand.

The ingredients shall be thoroughly mixed by volume in dry form. Care shall be taken to ensure that there are no hard lumps present. Water shall then be added and the ingredients thoroughly mixed as in **6.1.1**.

6.1.4 *Spreading of Lime Mortar*

Cleaning and wetting of the base shall be done in the same manner as specified in **6.1.2**. Lime mortar shall then be evenly and smoothly spread over the base and levelled with a screed batten to a slightly rough surface for providing key for the tiles. The thickness of mortar shall be the same as in the case of cement mortar, that is, 10 mm minimum and 30 mm maximum at any one place. Screeds properly levelled shall be fixed at the correct height to suit the thickness of the screeded bed. The area of bedding should be as much as can be covered with tiles during the following day. The freshly laid portion of the mortar bedding shall be protected from damage by providing suitable barricading.

7 LAYING OF TILES

7.1 After the tiles have been laid in a room or the day's laying work is completed, the surplus lime/cement slurry and the joints shall be cleaned and washed fairly deep with the help of a broom stick. It shall be seen that the slurry is cleaned before it sets hard.

7.2 The day after the tiles have been laid, the joints shall be filled with lime/cement grout of the same shade as the colour of the matrix of the tile. The freshly laid portion of the tiles shall be prevented from damage by providing suitable barricading.

7.3 Tiles which are fixed in the floor adjoining the wall shall penetrate about by 10 mm under the plaster, skirting or dado as may be required. For this purpose, the wall plaster should be left unfinished about 50 mm above the level of the proposed finished flooring/ skirting/dado level. The unfinished strip shall be plastered later on after the tiles are fixed.

7.4 After fixing, the flooring should be kept moist and allowed to mature undisturbed for seven days so that the bedding and joints set properly. After this, it may be used for light traffic. Heavy traffic shall not be allowed on the floor for at least ten days after fixing the tiles.

7.5 Wherever big areas of floor, above 3 m in length or width, are to be tiled, the level shall be fixed at in every 3 m intervals. The central portion of the floor shall be kept about 3 to 5 mm higher than the level marked at the walls unless specified otherwise. This is normally done to avoid the optical illusion of a depression in the central portion of the tiled hall.

7.6 The localized deviation shall not exceed 3 mm in a 3 m straight edge after the laying of whole floor is complete.

8 SKIRTING, DADO WORK AND STAIRCASE-TREADWORK

8.1 Tile skirtings/dado, where required, shall be fixed only after laying of the floor tiles is complete.

8.2 Before fixing tiles on brick or concrete wall, the wall surface shall first be wetted with clean water. Thereafter, in case of dado the wall surface shall be evenly and uniformly covered with about 10 mm thick level plaster of cement mortar (1 cement : 4 coarse sand). In the case of skirting, the tiles can be fixed directly on the wall with cement mortar (1:4 coarse sand) at the back of each tile backing. On dado the back of tiles shall be covered with a thin layer of neat cement paste and the tile shall then be gently tapped against the wall with a wooden mallet to achieve the required line and level. The fixing shall be done from the bottom of the wall upwards. Each tile shall be fixed as close as possible to the one another to give an even surface. The localized deviation shall not exceed 3 mm in a 3 m straight edge after the laying of whole dado is complete.

8.3 Precast treads and risers tiles for staircases shall be laid as described for flooring.

9 GRINDING AND POLISHING

9.1 Grinding and polishing of the tiles shall commence only after the floor as well as the joints have properly set and in no case earlier than ten days of laying.

9.2 For grinding terrazzo tile flooring, synthetic grinding stone of 80 grit may be used. When the floor is rubbed even and chips show uniformity it shall be cleaned with water making bare all pin holes. Grouting in the same shade is then briskly applied so that all pin holes are properly filled in. The grout shall be kept moist for a week for proper setting. Thereafter, the second grinding operation 100 grit is commenced. The floor is grouted again to fill in fine pin holes. After curing, the floor is left as it is till other works in the room/hall are completed and all workers quit. Before the final grinding the floor is swept clean. Final grinding is done with synthetic grinding stones of numbers 2 to 7, to get polishing sheen. Finally a tin oxide powder spread with nylon pad fitted in the machine add little water and run the machine in all direction and leave the area for a while. Then clean the surface with water. A coat of sealer or shiner can be applied to avoid absorption of oil.

9.3 Grinding of skirting preferably should be done using a handheld machine.

9.4 When grinding and polishing of dado, staircase tread and risers is done with hand held machine, the grinding and polishing shall be carried out in the same sequence as described in **9.2**.

9.5 In the case of plain cement and coloured tiles the process of polishing shall be the same as described in **9.2** except that initial grinding with synthetic grinding stone of 80 grit may not be necessary.

9.6 Chequered or grooved tiles normally do not require polishing.

10 APPEARANCE

10.1 The finished floor shall have an even, smooth and shining surface. Joints should be in correct alignment and pattern as shown in the drawings.

NOTES

1 Normally, all freshly laid tile-floors and dado work may show efflorescence even after the tiles are polished. This may be particularly noticeable in plain-tile floors. This may not affect the quality of the tiles or of the finished floor; the same may acquire a natural sheen after two to three months of daily cleaning. When all the salts from the concrete have come to the surface and are washed off, there will be no more trouble from this cause and the floor will require less work for its upkeep. If quality tiles have been used, their natural gloss will improve with age and wear.

2 Minor variations may occur in the shades of cement used in the matrix, in the colour and shade of the marble chips and in the distribution of the chips over the tiles.

11 MAINTENANCE

11.1 Care Immediately After the Work

11.1.1 After laying, the floor shall be allowed to remain clean and free from cement, oil, paint, distemper, plaster droppings and all materials likely to stain or spoil the tiles. If appliances, such as trestles, ladders, steps, etc, have to be used for electrician's, plumber's and other light work, it shall be ensured that parts contact with the flooring are padded by the contractor doing such work and no sliding the appliances on the finished flooring is permitted. The owner shall also take care, when the floor is used for subsequent operations, that staining, damaging or pitting of the tile-work is entirely prevented.

11.1.2 Stair finishes, particularly nosings, are liable to be damaged by dragging or dropping of articles up or down the stairs. It is, therefore, necessary to protect the stairs against such causes of damage.

11.2 Subsequent Maintenance

11.2.1 Polished tile-floors shall be regularly swabbed with clean water followed by brisk rubbing with dry linen. If they are very dirty, water and soap may be used. Care shall be taken to remove any soap film deposited in washing, as failure to do so will result in the floor becoming slippery and dull-looking. Use of soda, acid, etc, shall be avoided.

11.2.2 Resistance to staining is, to a great extent, dependent upon the degree of maintenance. Where bad stains have occurred, the advice of the manufacturer of the tiles may be sought for their removal.

ANNEX A

(*Clause* 2)

LIST OF REFERRED INDIAN STANDARDS

IS No.	*Title*
269 : 2015	Ordinary portland cement — Specification (*sixth revision*)
455 : 2015	Portland slag cement — Specification (*fifth revision*)
456 : 2000	Plain and reinforced concrete — Code of practice (*fourth revision*)
712 : 1984	Specification for building limes (*third revision*)
1237 : 2012	Cement concrete flooring tiles — Specification (*second revision*)
1489	Portland pozzolana cement — Specification
(Part 1) : 2015	Fly ash based (*fourth revision*)
(Part 2) : 2015	Calcined clay based (*fourth revision*)
2116 : 1980	Specification for sand for masonry mortars (*first revision*)
16415 : 2015	Composite cement — Specification

ANNEX E

(*Foreword*)

COMMITTEE COMPOSITION

Flooring, Wall Finishing and Roofing Sectional Committee, CED 05

Organization	*Representative(s)*
In Personal Capacity (*L/109, Sarita Vihar, New Delhi*)	Shri Ashok Khurana (***Chairman***)
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Construction Industry Development Council, New Delhi	Shri P. R. Swarup Shri Ravi Jain (*Alternate*)
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Morbi Dhuva Glaze Tiles Association, Morbi	Shri Nilesh Jetparia Shri Jeram Madhav Kavar (*Alternate*)
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MYK Laticrete India, Hyderabad	Dr P. Arjunan Shri N. Radhakanth (*Alternate*)
National Council for Cement and Building Materials, Ballabgarh	Dr S. K. Breja

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